Foundations

References:


**Figure 31.4** A gravel bed and a drain divert water away from the foundation. *Courtesy Boccia Inc.*

In termite regions, extend termite shield continuously from slab to exterior.

- **4-in. (Min.) reinforced slab**
- **Concrete-rated moisture barrier**
- **4-in. (Min.) compacted gravel or pea gravel**
- **Closed-cell rigid insulation to below frost line or 2 ft. (Min)**

**Foundation wall and footing**

**A Slab on Grade / Deep footing**

**Vertical interior insulation**
FIGURE 31.6 Shallow pilings are often made of concrete with steel reinforcement. The size, type, and placement of the reinforcement will vary, depending on the load to be supported, the depth of the piling, and the engineer's design. The piling on the left is being used to support a grade beam, which is a concrete beam placed below the finished grade to span between pilings. The piling on the right is used to support a wood post.
Foundations

TYPES OF FOUNDATIONS

Continuous or Spread Foundations

The most typical type of foundation used in residential construction

Consists of a footing and wall

The footing is the base of the foundation system and is used to displace the building loads over the soil

FIGURE 31.11 A footing, used to spread building loads evenly into the soil, is represented on the foundation plan by hidden lines.
Foundations

TYPES OP FOUNDATIONS

Fireplace Footings

Masonry fireplace will need to be supported on a footing - requires the footing to be a minimum of 12” (305 mm) deep and extend 6” (152 mm) past the face of the fireplace on each side.
Foundations

FOUNDATION WALL

The foundation wall is the vertical wall that extends from the top of the footing up to the first-floor level of the structure.

The height of the wall should extend 6” (152 mm) above the ground, although many municipalities require 8”.

<table>
<thead>
<tr>
<th>MINIMUM WIDTH OF STEM WALL (B)</th>
<th>Minimum Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plain Concrete</td>
<td></td>
</tr>
<tr>
<td>Walls less than 4’-6” (1372 mm)</td>
<td>6” (152 mm)</td>
</tr>
<tr>
<td>Walls greater than 4’-6” (1372 mm)</td>
<td>7.5” (191 mm)</td>
</tr>
<tr>
<td>Plain Masonry</td>
<td></td>
</tr>
<tr>
<td>Solid grout or solid units</td>
<td>6” (152 mm)</td>
</tr>
<tr>
<td>Non grouted units</td>
<td>8” (203 mm)</td>
</tr>
</tbody>
</table>
Steel anchor bolts are placed in the top of the wall to secure the wood mudsill to the concrete.

If concrete blocks are used, the cell in which the bolt is placed must be filled with grout.

The mudsill is required to be a 2 X 4 and be made from pressure-treated wood or to be made of some other water-resistant wood so that it will not absorb moisture from the concrete.
The mudsill must also be protected from termites in many parts of the country.

Among the most common methods of protection are:

1) metal caps between the mudsill and the wall
2) chemical treatment of the soil around the foundation
3) chemically treated wood near the ground
If the house is to have a wood flooring system, some method of securing support beams to the foundation must be provided. A 3” (76 mm) minimum bearing surface must be vided for the beam where it rests on concrete.
INTERIOR SUPPORTS

Interior loads are supported on spot footings, or piers, as seen in

Pier depth is generally required to match that of the footings

The placement of piers will be determined by the type of floor system to be used

The size of the pier will depend on the load being supported and the soil bearing pressure

Piers are usually drawn on the foundation plan with dashed lines
Foundations

INTERIOR SUPPORTS

- Exterior masonry wall and foundation
- Concrete slab on grade; see 3.18 for typical section
- Extruded polystyrene foam insulation; see 7.42.

Masonry Wall

- 6" (150) minimum clear distance from any wood to finish grade
- Pressure-treated sill plates
- Extruded polystyrene foam insulation may be placed on either the exterior or the interior of the foundation wall.
- Cast-in-place concrete or concrete masonry foundation wall

Stud Wall

- Isolated or integral footings are required to transmit loads from the superstructure above to the foundation soil.

- An independent footing should be used when a bearing wall or column transmits a heavy or concentrated load.

- The width and depth of the slab footing are determined by the magnitude of the load and the bearing capacity of the soil.

- A concrete ground slab may be thickened to support an interior bearing partition or post and transmit the load to the underlying soil.
Foundations
Metal connectors are typically used to resist the forces of uplift, shear, flooding, and seismic stresses.
Foundations

DIMENSIONING FOUNDATION COMPONENTS

When using a computer, the foundation plan is typically placed in the same drawing file as the floor plan

Foundation walls are dimensioned from face to face rather than face to center, as on a floor plan
Foundations

DIMENSIONING FOUNDATION COMPONENTS

FOOTINGS ARE LOCATED FROM EDGE OF SLAB TO CENTER OF FOOTING.

FOUNDATION WALLS SHOULD BE DIMENSIONED FROM FACE TO FACE.

23'-0" (OVERALL WIDTH)

DIMENSIONS FOR CHANGES IN CONCRETE WALLS

DIMENSIONS FOR INTERIOR BEAMS AND PIERS

FOUNDATION WALLS ARE DIMENSIONED FROM FACE TO FACE.

FOOTINGS CAN BE DIMENSIONED BY LEADER LINE OR NOTE.

FIGURE 31.44 ■ Dimensioning techniques for foundation plans.
A.18 GRAPHIC MATERIAL SYMBOLS

- Earth
- Gravel
- Rock
- Cast-in-place/present
- Great
- Mortar
- Brick
- Firebrick
- Adobe/hammered earth
- Concrete block
- Structural facing tile
- Slate
- Steel
- Aluminum
- Brass/bronze
- Finishes
- Finish
- Plywood
- Rough
- Blocking
- Plywood - large scale
- Plywood - small scale
- Stucco/soho fill insulation
- Rigid insulation
- Sprayfoam insulation
- Glass
- Glass block
- Terrazzo
- Tile/ceramic tile
- Acoustical tile
- Plastic laminate
- Planter
- Carpeting
**GLABS FOUNDATIONS**

**NOTE:**
GLABS lose heat most readily at their perimeters, where they are exposed to the air. So, glabs must be protected from heat loss by a closed-cell rigid insulation placed at their edges. The amount of insulation required will depend on the climate and on whether the slab is heated. The position of the insulation will depend primarily on the foundation type. Glabs integral with turned-down footings are insulated at the outside building edge. Glabs with deep footings are often insulated at the inside face of the foundation, although they may also be insulated at the outside building edge.

**SLAB W/ TURNED-DOWN FOOTING**
Warm climate, well-drained soil.

**WALL FINISH:**
- Stucco-wrapped insulation
- Stucco stopped & top of insulation w/flashing & protective coating over insulation
- P.T. mudsill 6" [600 mm]

**CLOSED-CELL RIGID INSULATION TO BELOW REBAR:**
- Footing below front line
- Rebar continuous & perimeter

**CONCRETE-RATED MOISTURE BARRIER:**
- 4-in. (min.) compacted gravel or pea gravel

**CONCRETE-RAISED SLAB CONTINUOUS W/ FOOTING:**
- 4-in. (min.) compacted gravel or pea gravel

**FRAMED WALL PROJECTED OVER INSULATION AND COATING:**
- P.T. mudsill 6" [600 mm]

**SLAB PERIMETER INSULATION**

**Cementitious coating protects insulation from ultraviolet light and mechanical abrasion.**
- Closed-cell rigid insulation to below front line, thickness varies.
- Termite shield if required

**SLAB W/ TURNED-DOWN FOOTING**
Insulation outside framing.

**TURNED-DOWN FOOTINGS**
6" [150 mm]

**DEEP FOOTINGS**
6" [150 mm]
**Foundations**

- **Forced-Air Duct in Slab**
  - Fiber-reinforced concrete distributes tensile strength around duct.
  - Slab w/ turned-down footing for forced-air duct footing.

**Utilities**

- **Plumbing Through Slab**
  - Plastic-sleeve pipe insulation isolates water pipes from slab.
  - 1-in. thick fiberglass wrap insulation isolates waste pipes from slab.

**Note:**
- Use type K or type L copper supply pipes. Minimize brazed fittings below slab. Hot-water insulation is recommended.

- **Plumbing Through Slab**
  - Use ABS plastic waste lines. No cleanouts are allowed below slab. Set closet flange at FPL and anchor directly & securely to slab.

**Radiant-Heat Slab**

- Polybutylene tubing has replaced copper tubing as the convoyer of hot water for radiant slabs. This plastic tubing is supplied in long rolls & can carry about 500 CFM without any joints below the surface. The addition of insulation below the slab will improve the performance of the system.

**Diagram of Radiant-Heat Tunneling**

- Slab
- Tubing
- Heat source
CONCRETE SLABS ON GRADE

Exterior masonry wall and foundation

Concrete slab on grade; see 3.15 for typical section

Extruded polystyrene foam insulation; see 7.42.

Masonry Wall

6" (150) minimum clear distance from any wood to finish grade
Pressure-treated soil plates

Stud Wall

- In warm or temperate climates where little or no ground frost occurs, it may be economical to thicken the edges of a concrete slab on grade to form integral footings for the exterior walls.

6" (150) minimum clear distance from any wood to finish grade
12" (305) minimum footing depth
Set below frostline.

Thickened Edge Slab

Isolated or integral footings are required to transmit loads from the superstructure above to the foundation soil.

An independent footing should be used when a bearing wall or column transmits a heavy or concentrated load.

12" (305) minimum

The width and depth of the soil footing are determined by the magnitude of the load and the bearing capacity of the soil.

A concrete ground slab may be thickened to support an interior bearing partition or post and transmit the load to the underlying soil.